

CLAIMS

1. A tracking control apparatus comprising:

5 focusing means for forming an optical beam spot on a recording surface of an optical disc by focusing light beam on the recording surface of the optical disc;

moving means for moving the optical beam spot in a radial direction of the recording surface of the optical disc;

10 photodetection means having a light receiving surface for detecting light reflected off the optical disc, in which the light receiving surface is separated into a plurality of areas, and each of the plurality of areas is formed to generate a received light quantity signal in accordance with a received light quantity and to output the received light quantity signal;

20 a filter section including a plurality of low-pass filters, in which each of the plurality of low-pass filters removes a component having a frequency equal to or higher than a predetermined cutoff frequency from a corresponding received light quantity signal among a plurality of the received light quantity signals output from the photodetection means;

25 a tracking error detection section for generating a tracking error signal indicating an amount of deviation of the optical beam spot from a track to be scanned on the recording surface of the optical disc by performing a predetermined calculation with respect to a plurality of signals output from the filter section; and

30 a tracking control section for driving the moving means such that the optical beam spot follows the track on the recording surface of the optical disc in accordance with the tracking error signal.

2. A tracking control apparatus according to claim 1, further comprising a band control section for controlling the filter section such that the predetermined cutoff frequency becomes
5 small as a recording speed for recording information on the optical disc increases.

3. A tracking control apparatus according to claim 1,
wherein:

10 the filter section further includes a plurality of equalizers, each of the equalizers amplifying a component of a predetermined frequency band included in a corresponding received light quantity signal among the plurality of the received light quantity signals output from the
15 photodetection means;

the optical disc apparatus further includes a switching section for selectively outputting one of a signal output from the low-pass filter and a signal output from the equalizer;

20 the switching section provides the signal output from the switching section to the tracking error detection section as the signal output from the filter section.

4. A tracking control apparatus according to claim 3, wherein
25 the switching section provides the signal output from the low-pass filter to the tracking error detection section when the optical disc apparatus is in a recording operation state with respect to a recordable optical disc, and provides the signal output from the equalizer to the tracking error
30 detection section when the optical disc apparatus is in a reproduction operation state with respect to an optical disc of a reproduction-only type.

5. A focus control apparatus comprising:

focusing means for forming an optical beam spot on a recording surface of an optical disc by focusing light beam on the recording surface of the optical disc;

5 moving means for moving the optical beam spot in a direction substantially perpendicular to the recording surface of the optical disc;

10 photodetection means having a light receiving surface for detecting light reflected off the optical disc, in which the light receiving surface is separated into a plurality of areas, and each of the plurality of areas is formed to generate a received light quantity signal in accordance with a received light quantity and to output the received light quantity signal;

15 a filter section including a plurality of low-pass filters, in which each of the plurality of low-pass filters removes a component having a frequency equal to or higher than a predetermined cutoff frequency from a corresponding received light quantity signal among a plurality of the 20 received light quantity signals output from the photodetection means;

25 a focus error detection section for generating a focus error signal indicating an amount of deviation of the optical beam spot from the recording surface of the optical disc by performing a predetermined calculation with respect to a plurality of signals output from the filter section; and

a focus control section for driving the moving means such that the optical beam spot follows the recording surface of the optical disc in accordance with the focus error signal.

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6. A focus control apparatus according to claim 5, further comprising a band control section for controlling the filter section such that the predetermined cutoff frequency becomes

small as a recording speed for recording information on the optical disc increases.

7. A tracking control method performing tracking control
5 by using a tracking control apparatus, wherein
the tracking control apparatus includes:

focusing means for forming an optical beam spot
on a recording surface of an optical disc by focusing light
beam on the recording surface of the optical disc,

10 moving means for moving the optical beam spot
in a radial direction of the recording surface of the optical
disc; and

15 photodetection means having a light receiving
surface for detecting light reflected off the optical disc,
in which the light receiving surface is separated into a
plurality of areas, and each of the plurality of areas is
formed to generate a received light quantity signal in
accordance with a received light quantity and to output the
received light quantity signal, the tracking control method
20 comprising the steps of:

25 using a filter section including a plurality of
low-pass filters to remove a component having a frequency
equal to or higher than a predetermined cutoff frequency
from each of a plurality of the received light quantity signals
output from the photodetection means;

30 generating a tracking error signal indicating an
amount of deviation of the optical beam spot from a track
to be scanned on the recording surface of the optical disc
by performing a predetermined calculation with respect to
a plurality of signals output from the filter section; and

driving the moving means such that the optical beam
spot follows the track on the recording surface of the optical
disc in accordance with the tracking error signal.

8. A tracking control method according to claim 7, further comprising the step of controlling the filter section such that the predetermined cutoff frequency becomes small as
5 a recording speed for recording information on the optical disc increases.

9. A tracking control method according to claim 7, further comprising the steps of:

10 using the filter section including a plurality of equalizers to amplify a component of a predetermined frequency band included in each of the plurality of the received light quantity signals output from the photodetection means; and

15 selectively outputting one of a signal output from the low-pass filter and a signal output from the equalizer as the signal output from the filter section.

10. A tracking control method according to claim 9, wherein
20 the signal output from the low-pass filter is output as the signal output from the filter section when the optical disc apparatus is in a recording operation state with respect to a recordable optical disc, and the signal output from the equalizer is output as the signal output from the filter section when the optical disc apparatus is in a reproduction operation state with respect to an optical disc of a reproduction-only type.
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11. A focus control method performing focus control by using
30 a focus control apparatus, wherein

the focus control apparatus includes:

focusing means for forming an optical beam spot on a recording surface of an optical disc by focusing light

beam on the recording surface of the optical disc,
moving means for moving the optical beam spot
in a direction substantially perpendicular to the recording
surface of the optical disc; and

5 photodetection means having a light receiving
surface for detecting light reflected off the optical disc,
in which the light receiving surface is separated into a
plurality of areas, and each of the plurality of areas is
formed to generate a received light quantity signal in
10 accordance with a received light quantity and to output the
received light quantity signal, the focus control method
comprising the steps of:

15 using a filter section including a plurality of
low-pass filters to remove a component having a frequency
from each of a plurality of the received light quantity signals
output from the photodetection means;

20 generating a focus error signal indicating an amount
of deviation of the optical beam spot from the recording
surface of the optical disc by performing a predetermined
calculation with respect to a plurality of signals output
from the filter section; and

25 driving the moving means such that the optical beam
spot follows the recording surface of the optical disc in
accordance with the focus error signal.

30 12. A focus control method according to claim 11, further
comprising the step of controlling the filter section such
that the predetermined cutoff frequency becomes small as
a recording speed for recording information on the optical
disc increases.

13. A signal processing apparatus used in a tracking control

apparatus, wherein

the tracking control apparatus includes:

focusing means for forming an optical beam spot
on a recording surface of an optical disc by focusing light
5 beam on the recording surface of the optical disc;

moving means for moving the optical beam spot
in a radial direction of the recording surface of the optical
disc; and

10 photodetection means having a light receiving
surface for detecting light reflected off the optical disc,
in which the light receiving surface is separated into a
plurality of areas, and each of the plurality of areas is
formed to generate a received light quantity signal in
accordance with a received light quantity and to output the
15 received light quantity signal, the signal processing
apparatus comprising:

a filter section including a plurality of low-pass
filters, in which each of the plurality of low-pass filters
removes a component having a frequency equal to or higher
20 than a predetermined cutoff frequency from a corresponding
received light quantity signal among a plurality of the
received light quantity signals output from the
photodetection means;

25 a tracking error detection section for generating
a tracking error signal indicating an amount of deviation
of the optical beam spot from a track to be scanned on the
recording surface of the optical disc by performing a
predetermined calculation with respect to a plurality of
signals output from the filter section; and

30 a tracking control section for driving the moving
means such that the optical beam spot follows the track on
the recording surface of the optical disc in accordance with
the tracking error signal.

14. A signal processing apparatus according to claim 13,
further comprising a band control section for controlling
the filter section such that the predetermined cutoff
frequency becomes small as a recording speed for recording
information on the optical disc increases.

15. A signal processing apparatus according to claim 13,
wherein:

10 the filter section further includes a plurality of
equalizers, each of the equalizers amplifying a component
of a predetermined frequency band included in a corresponding
received light quantity signal among the plurality of the
received light quantity signals output from the
15 photodetection means;

 the optical disc apparatus further includes a
switching section for selectively outputting one of a signal
output from the low-pass filter and a signal output from
the equalizer; and

20 the switching section provides the signal output from
the switching section to the tracking error detection section
as the signal output from the filter section.

16. A signal processing apparatus according to claim 15,
25 wherein the switching section provides the signal output
from the low-pass filter to the tracking error detection
section when the optical disc apparatus is in a recording
operation state with respect to a recordable optical disc,
and provides the signal output from the equalizer to the
30 tracking error detection section when the optical disc
apparatus is in a reproduction operation state with respect
to an optical disc of a reproduction-only type.

17. A signal processing apparatus used in a focus control apparatus, wherein

the focus control apparatus includes:

focusing means for forming an optical beam spot
5 on a recording surface of an optical disc by focusing light beam on the recording surface of the optical disc,

moving means for moving the optical beam spot in a direction substantially perpendicular to the recording surface of the optical disc; and

10 photodetection means having a light receiving surface for detecting light reflected off the optical disc, in which the light receiving surface is separated into a plurality of areas, and each of the plurality of areas is formed to generate a received light quantity signal in accordance with a received light quantity and to output the received light quantity signal, the signal processing 15 apparatus comprising:

a filter section including a plurality of low-pass filters, in which each of the plurality of low-pass filters removes a component having a frequency equal to or higher than a predetermined cutoff frequency from a corresponding received light quantity signal among a plurality of the received light quantity signals output from the photodetection means;

25 a focus error detection section for generating a focus error signal indicating an amount of deviation of the optical beam spot from the recording surface of the optical disc by performing a predetermined calculation with respect to a plurality of signals output from the filter section; and

30 a focus control section for driving the moving means such that the optical beam spot follows the recording surface of the optical disc in accordance with the focus error signal.

18. A signal processing apparatus according to claim 17,
further comprising a band control section for controlling
the filter section such that the predetermined cutoff
frequency becomes small as a recording speed for recording
5 information on the optical disc increases.